UDK 620. 91

ELECTRICAL MATERIALS INSULATION

Mirzaev Sardor Abdulladhonich, assistant
Fergana Polytechnic Institute
sarmir650@gmail.ru

Annotatsiya: Ushbu maqolada ta'kidlanishicha, har qanday gaz elektr kuchlanishiga duchor bo'lishidan oldin ham gazda tartibsiz harakatda bo'lgan ma'lum miqdordagi elektr zaryadlangan zarralar - elektronlar va ionlarni o'z ichiga oladi. Har qanday gazda elektr zaryadlangan zarralarning ma'lum soni bo'ladi-elektronlar va ionlar elektr kuchlanishiga duch kelgunga qadar ham gazda tasodifiy harakat qiladi.

Kalit so'zlar: dielektriklar, izolyatorlar, havo qatlami, suyuqliklar, musbat zaryadlar, ionizatorlar, rekombinatsiya.

Аннотация: В этой статье подчеркивается, что любой газ содержит определенное количество электрически заряженных частиц - электронов и ионов, - которые находятся в нерегулярном движении в газе еще до того, как на него подано электрическое напряжение. В любом газе будет определенное количество электрически заряженных частиц - электронов и ионов, которые будут беспорядочно перемещаться в газе еще до того, как он подвергнется воздействию электрического напряжения.

Ключевые слова: диэлектрики, изоляторы, воздушный слой, жидкости, положительный заряд, ионизаторы, рекомбинация.

Annotation: In this article highlights any gas contains a certain amount of electrically charged particles - electrons and ions - that are in an irregular motion in the gas, even before it is subjected to an electric voltage. In any gas there will be a certain number of electrically charged particles - electrons and ions are that will randomly move in the gas even before it is exposed to an electric voltage.

Keywords: dielectrics, insulators, air layer, liquids, positive charge, ionizers, recombination.

Introduction. Gaseous dielectrics include air consisting of a mixture of all gases and water vapor with gases. Most gases are used as dielectrics in gas-filled capacitors, air-high voltage inverters, and other electronic devices. Air surrounds all electrical devices and as a dielectric ensures their reliable operation in many ways[1].

Literature review. The wires of high-voltage power transmission lines attached to the masts using porcelain or glass insulators shall be insulated from each other only from the beginning to the end with an air layer. In a layer of air that directly touches the surface of high-voltage wires, sometimes purple light emanates from the electric crown, which emits a peculiar sound.

Figure 1. An electric crown around an open wire in the air.

Electrical corona occurs when the electrical insulating properties of the air deteriorate or when a very high voltage is applied to the air . In the process of this event, the energy is wasted, so it must be resisted[2].

This research work was studied by the following scientists: foreign scientists Lovegrove K., Burgess G. and Pye J.A. [3], Boldinsky G.I., Yunusov Y.Y.[4] and national scientists Gulyamova F.S., Akbarova D.M., Kosimova K.M.[5], Mukhitdinov M.M.[6] and others.

Gas (air pupae) trapped inside the solid insulation is particularly vulnerable to adverse operating conditions. In successively insulated layers, the electric field strength is distributed inversely proportional to their dielectric constant that is

$$\frac{E_1}{E_2} = \frac{\varepsilon_2}{\varepsilon_1} \qquad (1)$$

Many gas dielectrical absorption (e_1) the only index of the housing (table), a dielectric (e_2), the value of 2 to 8 cha and more name. Therefore, the intensity KA 2-8 times larger than the influence of intensity in the solid insulation of the remaining gases entering the solid insulation. This voltage can ionize the precipitated gas, that is, it can form a large number of electrically charged particles (electrons and ions)[7]. This often leads to tight insulation, resulting in breakdowns of electrical machinery, hardware, cables, and the like**.** Under normal operating conditions, the conductivity of gaseous dielectrics is very low and dielectric losses are low ($tg\,d \approx 10^{-6}$).

Analysis and results. Electrical conductivity of gaseous dielectrics

Even before any gas is exposed to an electric voltage , it contains a certain amount of electrically charged particles - electrons and ions, which are in a chaotic motion (thermal motion) in the gas . These can be charged particles of gas, as well as charged particles of solids and liquids - for example, substances mixed with air.

Electrically charged particles in the air are external energy sources of the gas (external ionizers); formed by the ionization of cosmic rays and sunlight, the Earth's radioactive radiation, and so on.

The essence of the ionization process of a gas under the influence of external ionizers is that the ionization wires transfer some of the energy to the gas atoms. As a result**,** the valence electrons have additional energy and are separated from their atoms**,** which turn into positively charged particles — positive ions. The resulting free electrons can move independently in the gas for a long time, or after a certain time they can bind to electrically neutral atomic and gas molecules and convert them into negatively charged ions.

Gaseous dielectrics, the main characteristic 1 - Table.

Dielectric	Density g / cm ^{3}	Dielectric absorption	Electrical strength, MV / m	Heat transfer coefficient *	Heat capacity *
Weather	1.0	1,00057	3.0	1.0	1.0
Nitrogen	0.97	1,00058	3.0	1.08	1.05
Hydrogen	0.69	1,00026	1.8	6.69	14.35
Carbon dioxide	1,529	1,00098	2.7	0.64	0.85

Elegaz	5.03	1.00191	7.2	1.25	0.60

When negatively charged (electrons) and positively charged (ions) particles are in irregular heat, some of them combine to form electrically neutral atoms and molecules of the gas.

If a certain amount of gas is placed between the metal electrodes**,** when the electrodes are energized, the charged particles in the gas are affected by electric forces - electric field strength[8].

Under the influence of these forces, electrons and ions move from one electrode to another, creating an electric current in the gas.

The more charged particles are formed in a gas per unit time, and the faster they move under the influence of electric field forces, the greater the current in the gas[9]. Obviously, as the voltage applied to the same volume of gas increases, so do the electric forces acting on the electrons and ions. This increases the velocity of the charged particles and, consequently, the current in the gas.

The volume of gas, depending on the voltage of the current increase in graphics *volt-ampere characteristics* de frustrated in the form of a curve described in (picture is 2).

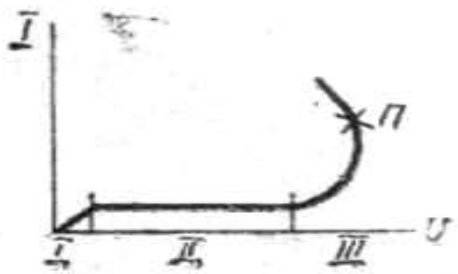

Figure 2. Voltammetric characteristics of a gaseous dielectric

This characteristic shows that in a weak electric field zone, when the electric forces acting on the charged particles are relatively small, the current in the gas increases in proportion to the applied voltage. The change in current in this zone occurs according to Ohm's law.

Discussion. As the voltage increases further (zone II), the proportionality between the current and the voltage is disturbed. The conductivity in this zone does not depend on the voltage. In this zone, charged particles of gas - ions with electrons - accumulate energy. With a further increase in voltage (zone III), the velocity of the charged particles increases sharply, as a result of which they begin to collide more frequently with the neutral particles of the gas. In such elastic shocks, electrons and ions transfer some of the energy they have accumulated to the neutral particles of the gas. As a result, electrons are released from their atoms. This creates new charged electrical particles: free electrons and ions[10].

Because flying charged particles often hit the atoms and molecules of the gas, new charged particles are formed much faster. In the process of impact ionization in gaseous dielectrics, the magnitude of the specific volumetric resistance of the gas (r *v*) decreases sharply and the angular tangent of dielectric losses (tg d) increases.

Conclusion. Obviously, gaseous dielectrics can only be used at voltages below the voltages at which the shock ionization process occurs. Under such conditions, gases are good dielectrics, their specific volumetric resistance is very large ($r \approx 10^{18}$ Ohm · m), and the angular tangent of dielectric losses is very small ($tg\ d \approx 10^{-6}$).

References

[1]Ignatov A.N., Kalinin S.V., Savinyx V.L. Basics of electronics. -N.: SibGUTI , 2005. –P. 323.
[2] Pryanishnikov V.A. Electronics: Lecture course. -SPb: Corona print, 2005. –P.400.
[3]Lovegrove, K.; Burgess, G.; and Pye, J. A new 500 m^2 parabolidal dish solar concentrator. Solar Energy, (2011), Vol. 85(4), 620-626.
[4]Gulyamova F.S., Akbarova D.M., Kosimova K.M. Study of the density of the cocoon shell by the luminescence method. / Silk, 1984 No. 3, -Pp. 28-29.
[5]Boldinsky G.I., Yunusov Y.Y. and others. About the light emission of the cocoon shell. /Silk. Tashkent, 1986, No. 2 - P.18-19.
[6]Mukhitdinov M.M. Optoelectronic measuring transducers. Tashkent, "FAN" 1983, -P. 128.
[7]Gatchin Yu.A, Tkalich V.L, Kanaev P.A , Simakov D.D. Materials of electronic means, Textbook. -SPb: SPbGU ITMO, 2010. –P.134.
[8]Kamolov Sh.M., Axmedov A.Sh. Electronic materials. -Tashkent 1994. –P.69.
[9]Abdurakhmanov, A.A., Paizullakhanov, M.S. & Akhadov, Z. Synthesis of calcium aluminates on the big solar furnace. Appl. Sol. Energy, (2012), Vol.48, 129–131.
[10] Mamasadykov Yu. Optoelectronic device for automatic control and sorting of cocoons by shell density, // Tez.dokl. XII All-Union Scientific Conference on Textile Materials Science. "Reliability, efficiency and quality of textile materials" / Kiev Technological Institute of Light Industry. 1988 - T.Z. Pp. 110-111.